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10/767,067	01/28/2004	Hemanth Sampath	MP0396	5464

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EXAMINER	
BARON, HENRY	

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2616	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/767,067	SAMPATH ET AL.	
	Examiner	Art Unit	
	Henry Baron	2616	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *14 November 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-94* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-94* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/ are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments/Remarks

1. Claims 1-94 are pending in action, with claims 1, 14, 26, 37, 48, 61, 73, and 84 being independent. Claims 1, 14, 26, 37, 48-73, and 84 are amended.

2. Applicant's arguments filed 11/14/2007 have been fully considered but they are not persuasive

3. With regards to the Section 101 rejection, the Examiner acknowledges Applicants has claims 48-72 to recite a "'computer-readable medium" having instructions stored thereon, which, when executed by a processor, causes the processor to perform operations recited in these claims.

4. The Examiner withdraws the rejections to claims 48-72 under 35 U.S.C. 101 in view of these amendments.

5. In reference to claim 1 and its dependent claims, Applicant argues that Kadous is understood to only disclose that each antenna transmits a data stream received from a respective transmitter at a selected rate and not understood to teach or suggest at least the following: a spatial multiplexing rate, mapping permutations for mapping one or more of a plurality of data symbols to a plurality of antennas, or the use of mapping permutations.

6. The Examiner notes that Kadous teaches a MIMO system that uses multiple transmit and receive antennas for data transmission. (1: [0033]). Further as shown in Figure 1, and 3: [0026] Kadous teaches a method for determining a set of data rates for multiple data streams based on limited channel state information may be implemented in various multi-channel communication systems. Such multi-channel communication systems include multiple-input multiple-output (MIMO) communication systems, orthogonal frequency division multiplexing (OFDM) communication systems, MIMO systems that

employ OFDM (i.e., MIMO-OFDM systems). Within the literature the MIMO transmission algorithm is referred to as V-BLAST or spatial multiplexing. (see Gesbert pg 283).

8. With regards to Applicant's argument regarding mapping permutations, Examiner notes that in a MIMO-OFDM system, the symbols are mapped to a set of antennas and tones in some manner. This, in turn, corresponds to at least one (of many) permutations. The claim cites one of the permutations.

9. Examiner argues that in this context Kadous indeed teaches a spatial multiplexing rate, mapping permutations for mapping one or more of a plurality of data symbols to a plurality of antennas, or the use of mapping permutations.

10. Applicant argues in a similar fashion that Kadous does not teach or suggest a spatial multiplexing rate, mapping permutations for mapping one or more of a plurality of data symbols to a plurality of antennas, or the use of mapping permutations with regards to claims 14, 26, 37, 48, 61, 73, and 84 and their respective dependent claims.

11. The Examiner maintains the same argument given for claim 1 for claims 14, 26, 37, 48, 61, 73, and 84 and their respective dependent claims.

12. In regards to claims 5 – 13, Applicant argues that Gesbert does not cure the deficiencies of Kadous as Gesbert discloses mapping each symbol stream onto one of a multiple TX antennas. Each TX antenna sees a differently encoded, fully redundant version of the same signal. Further, Applicant argues that Gesbert teaches away from mapping permutations or the use of mapping permutation and further Rietz does not cure the deficiencies of either Kadous or Gesbert since Rietz discloses that the number of combinations of n things taken r at a time equals n! / [r! x (n-r)!] and Rietz too teaches away from mapping permutations.

13. Examiner refutes Applicants argument noting that Gesbert teaches that M is (the range) of spatial multiplexing rates e.g. from maximum diversity to maximum multiplexing and Mt is the number of antennas, a principle of the claim 5 and 7, but does not enumerate a mapping permutations. However, this

element, permutations of M take Mt at a time, is fundamental in mathematics and Rietz is cited for this purpose. Examiner argues that it would have been obvious at the time the invention was made by a person of to having ordinary skill in the art to modify these teachings in the manner described.

14. Applicant argues in a similar fashion that Kadous, Gesbert and Rietz alone or in combination does not teach or suggest the spatial multiplexing rate, mapping permutations or the mapping permutations with regards to claims 41 – 47, 52 – 60, 65 – 72 , 76 – 83 , and 88 – 94 .

15. The Examiner maintains the same argument given for claim 5 – 13 for claims 41 – 47, 52 – 60, 65 – 72 , 76 – 83 , and 88 – 94 .

Claim Rejections - 35 USC § 102

16. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

17. A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

18. Claims 1 –4, 14 –17, 26-28, 37 –40, 48 – 51, 61 –64, 73 –75, and 84 –87 are rejected under 35 U.S.C. 102(e) as being unpatentable over Kadous et al (U.S. Patent 6,636,568).

19. Regarding Claim 1, 26, 48, and 73, Kadous teaches computer-readable medium, method and apparatus for receiving a selected spatial multiplexing rate, the spatial multiplexing rate corresponding to the plurality of mapping permutations; (Figure 5, read rate control), and for each of a plurality of data tones (Figure 5 read encoders block 512a), mapping the plurality of data symbols (Figure 5, block 516a) to a plurality of antennas (Figure 5 block 124a-t) using a corresponding one of the one or more mapping permutations. (16:[0010-0051])

20. Considering Claims 2 – 4, 27 – 28, 49 –51, and 74 –75, Kadous teaches that plurality of data tones comprise data tones in an OFDM symbol, mapping comprises space frequency coding the OFDM

symbol (16:[0052-0055]), and transmitting the coded OFDM symbol on the plurality of antennas (16: [0067]).

21. Regarding Claims 14, 37,61, and 84, Kadous teaches a method and apparatus for receiving space frequency coded symbol from a plurality of antennas (Figure 6, block 152a-r), with a selected spatial multiplexing rate, the spatial multiplexing rate corresponding to one or more mapping permutations; (Figure 5, read rate control), and for each of a plurality of data tones (Figure 5 read encoders block 512a), mapping one or more data symbols (Figure 5, block 516a) to a plurality of antennas (Figure 5 block 124a-t) using a corresponding one of the one or more mapping permutations. (16:[0010-0051]).

22. Considering Claims 17, 40, 64, and 87, Kadous teaches the space frequency coded symbol comprises a space frequency coded OFDM symbol. (16:[0052-0055]).

23. With regards to Claims 15, 16, 38, 39, 62,63, 85, and 86 Kadous teaches of linear decoding (19:[0028-0035) and nonlinear decoding (19: [0037-0049).

Claim Rejections - 35 USC § 103

24. The following s a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

25. Claims 5-13, 21-24, 29-35, 41-47, 52-60, 65-72, 76-83, and 88-94 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadous et al (U.S. Patent 6,636,568) in view of Gesbert, et al. From Theory to Practice: An Overview of MIMO Space–Time Coded Wireless Systems, IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS, VOL. 21, NO. 3, APRIL 2003, and in further view of Rietz, College Algebra pages 186 – 187, Henry Holt and Company, 1909.

26. Regarding Claims 5, 29, 52, and 76, Kadous teaches a method and apparatus comprised of receiving a selected spatial multiplexing rate (2: [0025-0030] read data rates) for each of a plurality of

data tones (3: [0030-0035] i.e. MIMO-OFDM) mapping one or more of a plurality of data symbols to a plurality of antennas (3: [0035 -0040] Nt transmit antennas). In Figure 1, Kadous teaches of demultiplexing (data source 112 to TX/RX 124i)

27. However, Kadous is silent in teaching of a spatial multiplexing rate corresponding to the mapping permutations of M_t !/(M!x(Mr-M)!) where M is the spatial multiplexing rate and M_t is the number of antennas.

28. Rietz teaches of plurality of mapping permutations comprise M_t !/(M!x(Mr-M)!) permutations, (page 186, Section 134; Combination of things all different) and Gesbert teaches that M is (the range) of spatial multiplexing rates e.g. from maximum diversity to maximum multiplexing and M_t is the number of antennas(page 287; Section IV Transmission over MIMO; General Principles; paragraph 1 – read and unification of categories).

29. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains to modify the *selected* spatial multiplexing rate teachings of Kadous to the range of multiplexing rate teachings of Gesbert using the permutation teachings of Rietz.

30. The modification would yield an improvement in transmission efficiency because the *selected* spatial multiplexing rate can be chosen to match channel conditions over any value within a range spatial multiplexing rates thereby optimizing the transmission system.

31. With respect to Claims 6, 7, 30, 53,54, and 77 Gesbert teaches of a range of spatial multiplexing rates e.g. from maximum or pure diversity to maximum or pure multiplexing (page 287; Section IV Transmission over MIMO; General Principles; paragraph 1 – read and unification of categories) selected from a plurality of available spatial multiplexing rates corresponding to the number of antennas.

32. Considering Claims 8, 31, 55, and 78, the nature of permutation mapping of the permutation (sic combination) of Rietz (page 186, Section 134; Combination of things all different) is cyclical.

33. With regards to Claims 9, 32,56, and 79, Gesbert teaches of mapping with an apparatus compliant with a standard selected from the group consisting of IEEE standards 802.16. (Page 297 Section; Standardized Models).

34. Considering Claims 10, 33, 57, and 80 Gesbert teaches of a range of spatial multiplexing rates e.g. from maximum spatial diversity to maximum multiplexing (page 287; Section IV Transmission over MIMO; General Principles; paragraph 1 – read and unification of categories).

35. With respect to Claims 11, 34, 58, and 81, Gesbert teaches of transmitting the data symbols from the antennas at a substantially equal power. (Page 284 equation 4 and equal power in subsequent paragraph).

36. Considering Claims 12, 35, 59, and 82, Gesbert teaches of mapping data symbols to antennas for each of data tones using less than the available tone-antenna combinations. (Page 287; Section IV Transmission over MIMO; General Principles; paragraph 1 – read diversity maximization).

37. Considering Claim 13, 36, 60, and 83, Rietz's combination teaches of one or more mapping permutations (sic combination) without reference to the order of individuals. (Page 186, Section 133).

38. Claims 18, 41, 65, and 88 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadous et al (U.S. Patent 6,636,568) in view of Gesbert, et al. From Theory to Practice: An Overview of MIMO Space–Time Coded Wireless Systems, IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS, VOL. 21, NO. 3, APRIL 2003, and in further view of Rietz, College Algebra pages 186 – 187, Henry Holt and Company, 1909.

39. Regarding Claims 18, 41, 65, and 88, Kadous teaches of a method and apparatus comprised of receiving a space frequency coded symbol from antennas, the space frequency coded symbol including data tones, (4: [0031-0045] read RX MIMO) for each of a plurality of data tones (3: [0030-0035] i.e. MIMO-OFDM) mapping one or more of a plurality of data symbols to a plurality of antennas (4: [0031 - 0045]).

40. However, Kadous is silent in teaching of a spatial multiplexing rate corresponding to the mapping permutations of M_t !/(M!x(Mr-M)!) where M is the spatial multiplexing rate and M_t is the number of antennas.

41. Gesbert teaches of a range of spatial multiplexing rates e.g. from maximum diversity to maximum multiplexing (page 287; Section IV Transmission over MIMO; General Principles; paragraph 1 – read and unification of categories).

42. Rietz teaches of one or more mapping permutations. (Page 186, Section 134; Combination of things all different).

43. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains to modify the received spatial multiplexing rate teachings of Kadous to the *range* of multiplexing rate teachings of Gesbert using the permutation teachings of Rietz.

44. The modification would yield an improvement in reception efficiency because the received spatial multiplexing rate can be chosen to match channel conditions over any value within a range spatial multiplexing rates thereby optimizing the receiving system.

45. With respect to Claims 19,20, 42, 43, 66, 67, 89, and 90, Gesbert teaches of a range of spatial multiplexing rates e.g. from maximum or pure diversity to maximum or pure multiplexing (page 287; Section IV Transmission over MIMO; General Principles; paragraph 1 – read and unification of categories) selected from a plurality of available spatial multiplexing rates corresponding to the number of antennas.

46. Considering Claims 21, 44, 68, and 91, the nature of permutation mapping of the permutation (sic combination) of Rietz (page 186, Section 134; Combination of things all different) is cyclical.

47. With regards to Claims 22, 45, 69, and 92, Gesbert teaches of mapping with an apparatus compliant with a standard selected from the group consisting of IEEE standards 802.16. (page 297 Section; Standardized Models).

48. With respect to Claims 23, and 70, Gesbert teaches of a range of spatial multiplexing rates e.g. from maximum spatial diversity to maximum multiplexing (page 287; Section IV Transmission over MIMO; General Principles; paragraph 1 – read and unification of categories).

49. In regards to Claims 24,71, and 94, Gesbert teaches of receiving the data symbols from the antennas at a substantially equal power. (Page 284 equation 4 and equal power in subsequent paragraph).

50. Considering Claims 46 and 93, Gesbert teaches of mapping data symbols to antennas for each of data tones using less than the available tone-antenna combinations. (Page 287; Section IV Transmission over MIMO; General Principles; paragraph 1 – read diversity maximization).

51. Considering Claim 25, 47, 72, and 94, Rietz's combination teaches of one or more mapping permutations (sic combination) without reference to the order of individuals. (Page 186, Section 133).

FINAL ACTION

52. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

53. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Conclusion

54. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Henry Baron whose telephone number is (571) 270-1748. The examiner can normally be reached on 7:30 AM to 5:00 PM E.S.T. Monday to Friday.

55. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Seema Rao can be reached on (571) 272-3174. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

56. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

HB

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